

Broken Stringers Can Be Recovered By Splicing, Research By Pallet Lab Shows

Results Show Splicing Can Restore Bending Strength 100 Percent

By Chaille Brindley

With the increasing prices of lumber, pallet manufacturers and recyclers are looking to squeeze every dollar out of their operations. A recent study on stringer repair reveals another potential area of the business that may be squeezed.

The study by Dr. Marshall White, director of the pallet and container research laboratory at Virginia Tech, shows broken stringers can be recovered by splicing. The research was funded and sponsored by the USDA Forest Service Southern Research Station.

The pallet lab has concluded a study of the effectiveness of splicing stringer segments with metal connector plates. The results show splicing can restore bending strength. Sawn stringers joined by a 3-by-4 truss plate can exhibit 100 percent bending strength of a new non-spliced stringer. However, the spliced stringer never has the original stiffness, although this is not a problem for many pallet users.

There is a catch, though. A gap between the two stringer segments can reduce performance significantly. "The quality of the splice is going to be critical," said White. A gap can reduce strength by an average of 35 percent. During splicing, end pressure should be used, and smooth sawn matching surfaces are required at the splice.

Static bending tests were performed on spliced stringers and assembled pallets containing spliced stringers. The study was done using static bending tests where a balloon was inflated until it pressed against the pallet, causing it to break. The species of wood tested were oak, southern yellow pine, yellow poplar and two combined species. Both truss and plug plates were used in the testing. All the spliced stringer segments were notched. Three splicing methods were used: vertical, angle and vertical with a 1/4-inch gap between the segments.

Vertically spliced stringers with 3-by-4 and 3-by-6 truss plates were the best

designs of those tested, according to the report. Interestingly, the 3-by-4 truss plate resulted in an average of 26 percent stronger splices than splices using a plug plate.

The study shows mixing species will not dramatically decrease the strength of the splice but the weaker species will clearly govern performance, White said. More importantly, the width of the stringer segment should be matched to within 1/8-inch.

Most plate failures occurred at the edge of the plate on the tension side -- usually the bottom of the stringer. The report concluded that reinforcing the area by improving the structural design of the metal plate is a key.

Avoid using a spliced stringer as the center stringer in a GMA pallet because it must support most of the load on the pallet.

The study did not deal with the financial implications of splicing.

The truss industry has used splicing for over 40 years, noted Tom Medeen, a salesman for Clary, a Texas firm which manufactures plates and plating equipment. However, the pallet industry largely does not use the practice. "It's been a cosmetic thing for people," said Medeen. Some pallet users associate a negative stigma with spliced stringers, he said.

Clary makes a stringer splicing device called the Lumbermizer that has drawn interest from produce pallet manufacturers in California, according to Medeen. The Lumbermizer clamps the segments in place and applies two plates at the same time. A worker can splice 60 to 80 segments per hour, Medeen said.

"The only thing you lose in splicing is elasticity of the board," said Medeen. For that reason, splicing would not be suitable for pallets destined for use in automated warehouses, where stiffness is just as important as strength. However, in settings where stiffness is not an issue, splicing may be feasible.

The research applies only to notched stringer segments, White noted. The pallet lab may conduct additional studies testing the merits of splicing longer unnotched segments and different size segments, he said.

For now, the hurdle for pallet manufacturers and recyclers is getting users past the negative appearance of spliced stringers. The study, particularly the research demonstrating that splicing restores bending strength, provides a boost to get over the hurdle.

For more information about this research, contact White at (540) 231-7134.

